"The Occurrence of nutritive Fat in the Human Placenta. A Preliminary Communication." By THOMAS WATTS EDEN, M.D., M.R.C.P. Communicated by Dr. PYE SMITH, F.R.S. Received April 23,—Read May 7, 1896.

(From the Laboratories of the Conjoint Board of the Royal Colleges of Physicians (Lond.) and Surgeons (Eng.)).

Recently, while examining specimens of ripe placentæ for fatty degeneration, I was struck by the regularity of the occurrence of fat in this structure, and especially by the nature and extent of its distribution. I was then led to examine a series of specimens taken at different periods of gestation, with the result that a free deposit of fat was found in ten different placentæ, all of which I believe to be non-pathological, and ranging practically through all periods of gestation, from the sixth week up to term.

The method employed for the demonstration of this fat, was to take slices from different parts of the placenta, and harden them for a few days in Müller's fluid; then to transfer thin strips, not exceeding one-third of an inch in thickness, to Marchi's fluid (1 per cent. solution of osmic acid 1 part, Müller's fluid 2 parts) for a week. The pieces were then embedded in paraffin, cut with a rocking microtome, and stained lightly with saffranine, eosine, or logwood and eosine, or mounted unstained. By this process the fat is completely blackened, while the other tissues retain their normal staining reactions, so that the outlines of the fat-containing cells can be distinctly made out.

By this method I have been able to demonstrate the constant occurrence of fat in certain well-defined regions of the human placenta.

In the young human placenta, the epithelial covering of the villi consists of two layers, a superficial, nucleated, plasmodial layer, and a deep cellular layer. In a six weeks' ovum I found fat in the form of minute droplets in both these layers, but much more abundantly in the former than in the latter. These fat droplets show comparatively little variation in size, and they remain discrete, showing little or no tendency to form larger droplets by fusion; they are confined to the perinuclear protoplasm, and are never found in the nuclei, which remain unaltered in number, form, and arrangement. The stroma of these villi contains here and there a trace of fat, but it is apparently healthy, and is furnished with well-formed wide capillaries filled with blood. The villi are, in fact, to all appearance healthy. Every villus does not show this deposit of fat, but it is present in very large numbers of them; in every field of the microscope several villi

containing fat may be found. The amount of fat also varies considerably.

In a young ovum the plasmodial layer of the villi shows great proliferative activity; it throws out numerous club-shaped processes or buds, which represent the first stage in the development of new villi. These buds very frequently contain large numbers of minute fat droplets. I believe that this is a point of very great importance, showing, as it does, that the deposit of fat occurs in actively growing tissues of undoubted vitality.

In the ripe placenta the proliferation of the plasmodial layer has ceased, and degenerative changes are present in scattered regions. But, of course, the great majority of the villi retain their vitality, and in these villi a free deposit of fat is present, showing the same distribution and characters as in the young placenta.

I have also found a similar deposit of fat in the serotina. The six weeks' ovum, above referred to, showed very many decidual cells containing minute, discrete droplets of fat in the perinuclear protoplasm. A placenta of the sixth month also showed an abundant fat deposit in the same region. At term, the serotina shows many degenerative changes, and although it contains fat, it may well be doubted whether, at this period, this is a physiological deposit.

The placenta, indeed, appears to be a storehouse of nutritive fat, just as is the liver. This appears to throw some light on what has long been one of the problems of fœtal physiology, viz., the source from which the fœtus obtains its supplies of fat. Diffusible substances such as sugar, salts, peptones, &c., were supposed to pass by osmosis from the maternal blood in the inter-villous spaces, to the fœtal blood in the villi. But this could not be assumed of indiffusible substances such as fat. The truth would seem to be that fat is deposited from the maternal blood in the epithelium of the villi, and stored up there by the fœtal tissues for their use. No great accumulation of fat occurs, as it appears to be from time to time absorbed and disposed of by the fœtal circulation. It is, however, not altogether clear how a deposit of fat in the decidual cells can be made available for the purposes of fœtal nutrition.

Since finding this fat deposit in the human placenta, I have begun a series of comparative observations upon the placentæ of other mammals. Up to the time of writing, I have examined two rabbits' placentæ, one from an early, and the other from a late, period of gestation. In both there was a marked deposit of fat, chiefly in the superficial glandular layer of the maternal placenta, but also, though to a less extent, in the processes of the chorionic mesoblast, which form the homologues of the villi of the human placenta.

The process appears to correspond closely to that observed by Mr. George Brook, in the transmission of fat from the yolk to

the segmenting germinal area, by the parablast of mesoblastic ova.*

I was under the impression when these observations were made, that fat had never been found, in this form, in the placenta before. I find that I am to some extent anticipated by a paper in the 'Archiv für Gynaekologie,' February, 1896.† One of the authors (Aschoff) wished to examine a malignant uterine growth, which he believed to be of the nature of *Deciduoma malignum*. Before doing so, he examined several specimens of young human ova, in order, as he says, to learn something of the structure of growing chorionic villi. Some of the specimens he hardened in Flemming's solution, and in all of these he found fat in the plasmodial layer of the villi. Aschoff's description of the fat deposit agrees very closely with that already given of my own specimen. "An den Flemmingschen Präparaten ist das Syncytium dadurch ausgezeichnet, dass es in seiner Randzone eine dichte Anhäufung feinster Fetttröpfchen trägt. Dieselbe sind bald sehr fein, bald grobkörnig, aber in den betreffenden Abschnitten des Syncytiums stets von gleicher Grösse . . . . . Die Fetttröpfchen überall sich finden, wo Chorionepithelzellen, in directesten Stoffwechselaustausch mit den Intervillösenräumen treten" (p. 531).

Aschoff scarcely appreciates the physiological importance of the observation, but there can be no doubt that his observations and my own are mutually confirmatory.

"Note on the Larva and the Postlarval Development of *Leucosolenia variabilis*, H. sp., with Remarks on the Development of other Asconidæ." By E. A. Minchin, M.A., Fellow of Merton College, Oxford. Communicated by Professor E. Ray Lankester, F.R.S. Received April 25,—Read May 21, 1896.

Introductory Remarks.

Through the kind hospitality of Professor de Lacaze-Duthiers, I was able to spend the spring and summer of last year at the marine laboratories of Banyuls-sur-Mer and Roscoff, where I was chiefly engaged in studying the embryology of the Ascons. In Banyuls I obtained the larvæ of *Leucosolenia cerebrum*, H. sp., in June, and of *L. reticulum*, O.S. sp., in July. In Roscoff I found the larvæ of *L. variabilis*, H. sp., all through August and the early part of September,

* "Formation of the Germinal Layers in Teleostei," 'Roy. Soc. Edin. Trans.,' 1896.

† "Ueber bösartige Tumoren der Chorionzotten," Apfelstedt und Aschoff.